

Appendix C

OPERATIONAL RISK MANAGEMENT AND SAFETY GUIDE

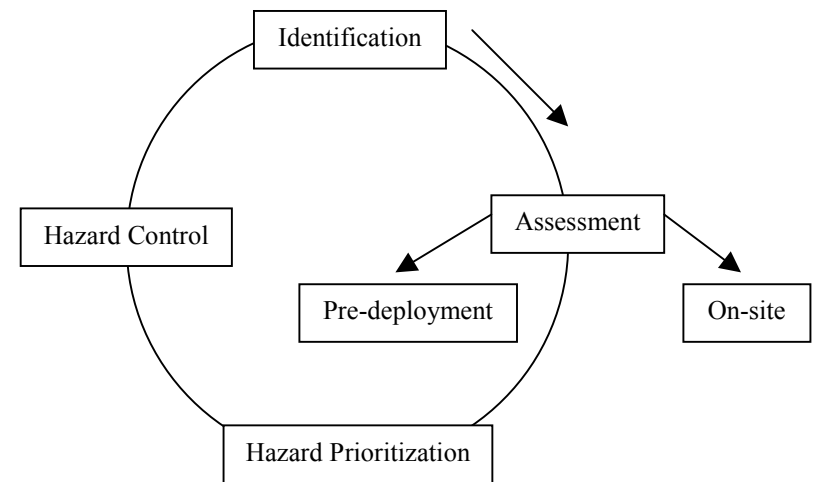
Ref: (a)Operational Risk Management
COMDTINST 3500.3



Operational Risk Management Process

1. Identify Mission Tasks
2. Identify Hazards
3. Assess Risks
4. Identify Options
5. Evaluate Risk vs. Gain
6. Execute Decision
7. Monitor Situation

THE HAZARD CYCLE (For ORM Steps 2 and 3)



1. IDENTIFY MISSION TASKS

(Self explanatory)

2. HAZARD IDENTIFICATION

Types of Hazards:

Physical	Chemical/Biological	Animal/Plant	Human
Slipping	Explosion	Bites/Stings	Violence
Tripping	Flammable	Poison	Poor Lifting
Fall	Air Reactive	Thorns/burrs	Repetition
Overhead	Water Reactive	Disease	Swarms
Heat Stress	Chemically Reactive	Feces/Coliforms	Poor posture
Cold Stress	Alpha Radiation		Awkward motion
Electrical	Beta Radiation		Fatigue
Blunt Objects	Gamma Radiation		Poor hygiene
Sharp Objects	X-Ray		Illness
Noise	Bio-weapon		Alcohol/Drugs
Vehicle	Chemical weapon		Over crowding
Fire	Irritant		Poor comms
Sun/UV Glare	Asphyxiant		Noise
Sun Burn	Oxidizer		Smoking
Pinch Points	Carcinogen		Driving
Machinery	Corrosive		
Lightning	Cryogenic		
Drowning	Toxic		
Engulfment	Biomedical		
	Particulates		
	Fumes (weld etc.)		
	O2 Deficiency		

3. RISK ASSESSMENT

Risk = Severity x Probability

Conduct risk analysis before departing workplace (pre-deployment) and once you arrive on-site.

a. Severity (of Hazard)

Potential consequence of an event measured in terms of degree of damage, injury or impact on a mission.

Range	Relative Rank	Health Examples
None or slight	1	None to minimal annoyances (mosquitoes)
Minimal	2	Temporary damage with irritant qualities only
Significant	3	Temporary damage, impairing mental/physical ability
Major	4	Temporary long-term damage needing hospitalization
Catastrophic	5	Permanent damage, loss of limb or life

b. Probability

The likelihood that the potential consequences will occur.

A number of factors influence the probability of a hazard consequence. They can be divided into the following categories:

Environment Time Source Human Interaction Work

They can increase or decrease the probability of the hazard

When considering these factors, it is important to determine how these factors change the hazard in relation to hazard recipients (public, workers, responders, environment, property, etc.). Do they make the hazard more likely to effect a recipient or less likely?

Environment

Factor	Intensity of Factor	Result
Wind	Increase	Increase dispersion Increase cold stress Increase plume/vapor directional flow Increase evaporation Increase slips/trips/falls
Rain	Increase	Increase in chemical plume washout Increase runoff Increase gravitational flow Increase slips/trips/falls Decrease visibility
Water Currents	Increase	Increase in dispersion Increase directional flow Decrease boat handling ability Increase drowning danger
Sea State	Increase	Increase dispersion Increase evaporation Decrease directional flow Decrease boat handling Increase drowning danger
Sunlight	Increase	Increase photo-oxidation (chemical change) Increase UV eye-glare hazard Increase sunburn hazard
Temperature	Increase	Increase heat stress Decrease viscosity (thickness) Increase evaporation Increase photo-oxidation (change) Increase chemical reaction
	Decrease	Increase cold stress (Opposite of heat increase)
Fog	Increase	Decrease visibility Increase surface slipperiness

Time

Increase	Duration of exposure increased Evaporation progressed Diminished chemical volatility Diminished chemical reactivity
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Source

<ul style="list-style-type: none">• Amount spilled• Visibility, how noticeable• Toxicity• Evaporation Rate/ Volatility• Persistence• Vapor pressure• Flammability/Explosive• Odor threshold	<ul style="list-style-type: none">• Viscosity• Air Density• Specific Gravity• Solubility• Water mixing• Reactivity• Oxidizer• Carcinogenicity
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Human

<ul style="list-style-type: none">• Age• Fitness level• Weight• Current Health• Training	<ul style="list-style-type: none">• Medications• Temperature acclimatization• Stress• Fatigue• Communications
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Work

<ul style="list-style-type: none">• Proximity to hazard• Degree of hazard handling• Increased breathing due to work• Awkward movements required• Repetitive motion	<ul style="list-style-type: none">• Degree of hazard movement• Heavy Loads• Mental Stress• Forceful exertion required• Increased body heat generation
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(1) Probability Rating

The likelihood that the potential consequences will occur.

Range	Relative Rank
Impossible/Remote	1
Unlikely under normal conditions	2
About 50-50 chance	3
Greater than 50% Chance	4
Very likely to happen	5

Example

Activity	Relative Rank
Fire/explosion from closed gas container	1
Fire/explosion when pouring gas	2
Smoker nearby while pouring gas	3
Welding close but not in contact with gas	4
Bring flame in contact with gas	5

c. Prioritize Hazards

- (1) Multiply severity and probability relative ranks.
- (2) Rank hazards in descending order starting from lowest (1) to highest (25).

4. **IDENTIFY CONTROL OPTIONS**

a. Engineering Controls

Barriers	Shields	Dams
Capping	Covering	Fencing
Terminating	Shutting	Blocking
Chocks	Enclosures	Diverter
Flanging	Guarding	Substitution
Anchoring	Ventilation	Blowing
Scaffolding	Grounding	Substitution
Bonding	Insulation	Lighting
Locks, Tags	Kill-switches	Shut-off valves
Taglines	Circuit Breakers	Process change
Plugging, patching	Sealing	Absorbers

b. Administrative Controls

Reduced work duration	Worker rotation	Safety plans
Training	Safety briefs	Relief personnel
Maintenance	Drinking fluids	Work/rest periods
Good housekeeping	Roving security	Signs
Warning lights	Alarms	Break areas
Pre-inspections	Field checks	Buddy system
Line of sight comms	Comms schedule	Equipment staging
Load shifting	Hazard marking	Placarding
Labeling	Hand signals	Safety observers
Fendering	Work plans	Replenish fluids
Handcarts/trolleys	Fire extinguishers	Drum bulking
Eye Wash Station	Hand washers	Showers

c. Personal Protective Equipment Controls

Hard hats	Steel-toed shoes	Safety glasses
Safety goggles	Face shields	Hearing Protection
Life jacket	Fall arrests	SCBA
APRs	Chemical suits	Flash suits
Fire resistant suits	Work gloves	Chemical gloves
Sun glasses	Sun-block	Life rings
Eye wash stations	Night vision	Thermal protection
Dry/wet suits	Hand warmers	Wind breaker coat
Knee pads	Over garments	Coveralls
Booties	Cooling vests	Chap lip protection
Hats for warming	Gloves (warmth)	Clothing (warmth)

5. EVALUATE RISK VS. GAIN

Risks (High, Med, Low)		Gains (Check appropriate)			
Response Personnel			Save	Protect	Mitigate
Other Agency Persons		Human Health			
Private Response Persons		Environment			
Organizational Property		Property			
Other Agency Property		U.S. Security			
Private Response Property		Economic			

6. EXECUTE THE DECISION

7. MONITOR THE SITUATION

a. Human Health

- (1) Conduct medical monitoring (heart rate, blood pressure, body temperature, etc).
- (2) Monitor personal symptoms.
- (3) Fatigue Symptoms

Forgetfulness	Moody	Fixation
Slowed Reaction	Indecisiveness	Lethargy
Poor Comms	Reduced Vigilance	Nodding Off
Apathy		

(4) Cold Stress Symptoms

Type	Symptom
Hypothermia	Mental alertness reduced Fatigue Slow physical reaction Apathy Pain in extremities Maximum shivering Dilated pupils Clouded consciousness Poor decision making
Frostbite	Whitened areas of skin Burning sensation at first Blistering Affected area cold, numb tingling

(5) Heat Stress Symptoms

Type	Symptom
Heat Stroke	Skin is hot Skin is dry Skin is red & spotted Body Temp > 105 Mental confusion Convulsions Unconscious
Heat Exhaustion	Extreme Weakness Giddiness Headache Nausea Vomiting Skin clammy, moist Face pale/flushed Body Temp normal Body Temp elevated
Heat Cramps	Painful muscle spasms Profuse sweating
Fainting	Lack of blood to brain
Heat Rash	Skin rash Prickly heat feeling

b. Action Levels

Type	Measurement
Oxygen	%
Combustibility	%
Toxic Limits (ex. TLV)	Varied units
Radiation	Varied units

c. Changes in the Hazard Source

Form	Fuming	Temperature	Vapors
Bulging	Noise	Compression	Leakage
Color	Texture	Size	Reaction

d. Changes in Work Activity

New Management	Source stirring	New personnel	Diverting, damming, diking
Blanketing	Intensity	Source interaction	Material handling
Day/Night	# Breaks	Change in Facilities	Change in Location
Duration			

e. Changes in the Environment

Temperature	Sunlight	Wind	Cloud cover
Water color	Surfaces	Sea State	Vegetation
Animal behavior	Animal appearance	Visibility	Corrosion
Currents	Water levels	Precipitation	

f. Equipment

Gauges	Background check	Reproducibility
Accuracy	Noise output	Drift readings
Shock sensitivity	Exhaust output	Pump activity
Battery life	Intrinsic Safety	Radio interference
Water damage	Decontamination	Vibration
Last service date	Calibration log	Physical appearance
Gaskets	Filters	Fluid/Air pressure levels
Safety features	Electrical wires	Grounding, bonding
Hose kinks/bends	Attachments	Fittings
Leaks/hissing	Performance Parameters	Comms check conducted

g. Personal Protective Equipment

i.) Head, Eye, Ear, Hand and Other Types of Protection

Hard hat not cracked, damaged, worn, fits properly & meets safety standards
Eye protection suitable for hazard type and meets standards
Ear protection in good condition & meets noise hazard level
Sunglasses with proper UV protection used when appropriate
Sun screen used in heavy UV environment
Proper type of glove used to address hazard
Gloves fit tightly and with no chance of being caught in pinch points
Proper life jackets used and securely attached to wearer
Proper footwear (steel toed shoes) and foot-to-surface friction attained.
Fall protection used where necessary

ii.) Air Purifying Respirators & Self Contained Breathing Apparatus

Mask, seals, valves and straps not deteriorated cracked or worn
Proper APR cartridge for mask (by hazard and by manufacturer)
Mask lens clear and free of obstructions
Sun glare cap for lens available if needed
Mask lens applied with defogging agent or use nose cup
Mask passes field negative pressure tests
Optical kits available for personnel who need them
SCBA bottle full of proper grade of air
SCBA bottle service life not expired
SCBA bottle hydrostatically tested within prescribed dates
Main line, bypass valve and regulator operative
Alarms working
Regulator not filled with condensation in cold weather
“O” rings in place in hoses and masks
Breathing tube not deteriorated, passes field “stretch” test
SCBA Mask passes negative pressure, one handed field test

iii.) Protective Suits

Seams free of defects and holes
Free of deterioration, tears, and holes
Free of pin holes (hold up to sun or flashlight)
Free if discoloration, swelling and stiffness
Free not brittle due to extreme cold weather
Zippers and latches waxed in cold weather
Suit not significantly creased
Suit log indicates maintenance tests within prescribed periods (i.e. 6 months)

h. Contamination Avoidance and Decontamination

Proper decontamination method chosen
Zones of control (Hot, Warm, Cold) clearly marked and secured
Entry personnel aware of heavy contaminated areas to avoid within Hot Zone
Minimum amount of decontamination personnel used to decontaminate entry team
Proper decontamination steps used
Personnel properly showered and cleaned prior to departing site
Disposable work clothes used beneath protective clothing
Protective clothing properly decontaminated and disposed of
Work clothing laundered in separate facility not at worker homes

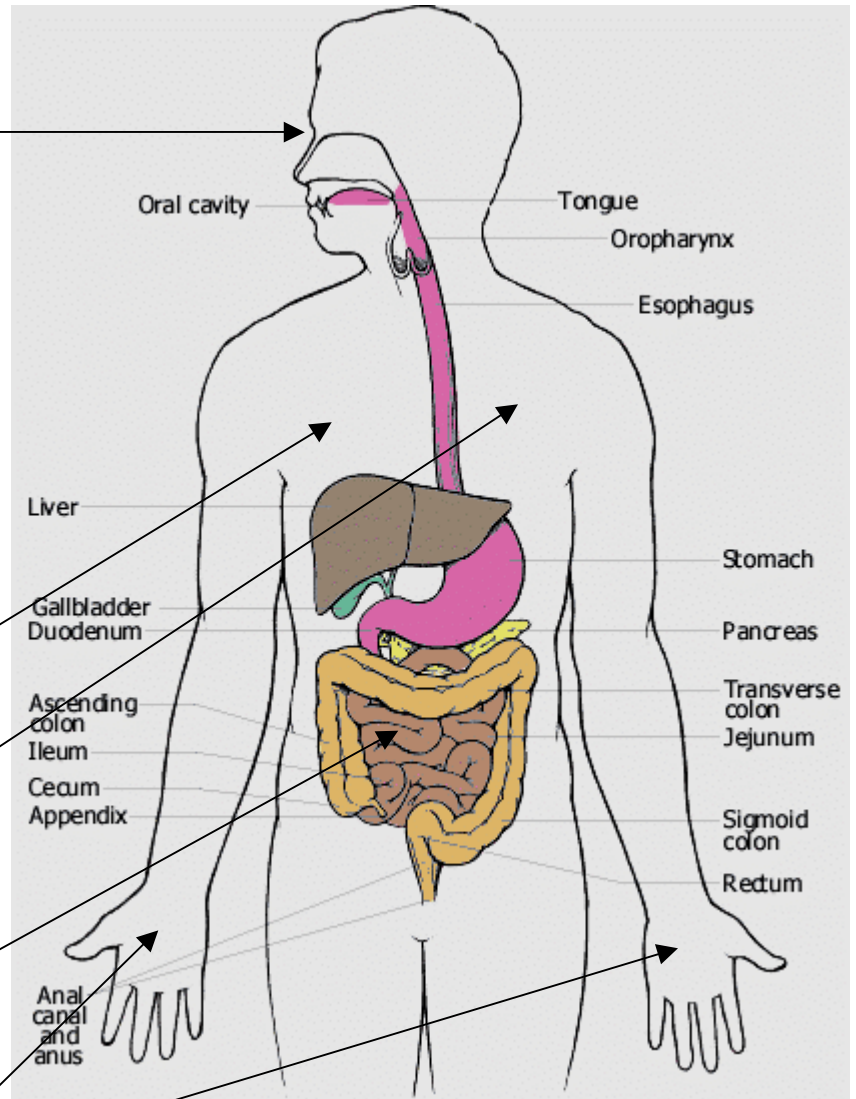
HEADACHE
LIGHTEADEDNESS
DIZZINESS
DROWSINESS
EXHILARATION
GIDDINESS
REDDENING OF FACE
NERVOUSNESS
RESTLESSNESS
CONFUSION
DISTURBED VISION
ABNORMAL SALIVATION
DIFFICULTY HEARING

DRYNESS/IRRITATION
COUGHING, SNEEZING
DIFFICULTY BREATHING
IRREGULAR HEARBEAT

ABDOMINAL PAIN
NAUSEA
VOMITING
BACK PAIN

RED, RASH, BLISTERED, OR
BURNED SKIN

ADDITIONAL SYMPTOMS:
PAINFUL MOVEMENT
NUMBNESS
DIARRHEA
WEAKNESS
SWEATING
SWELLING/SORENESS
BLEEDING



NOTE: *You may suffer from one or many symptoms.*